

# Technical data sheet



Product: 235

Manufacturer: 3M DEUTSCHLAND GMBH

Product group: ELEKTRO

Article group: VERGUSSMASSE

Download: 11.03.2026

## 3M™ SCOTCHCAST™ ELECTRICAL RESIN 235

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# Scotchcast™ Electrical Resin 235

Two-Part, Oven-Curing, Class B, Semiflexible, Unfilled Epoxy Liquid Resin

## Data Sheet

### Product Description

3M™ Scotchcast™ Electrical Resin 235 system has permanent semiflexibility, thermal shock and impact resistance, good electrical and adhesion properties. This low-viscosity resin is well suited to a variety of general purpose, Class B (130°C) applications. Its low viscosity and good wetting characteristics allow complete impregnation of even small coils, and it has the mechanical strength and flexibility needed for high-quality insulation of large castings, such as motors, transformers and coils.

- Low viscosity
- Class B (130°C)
- Good flexibility

### Handling Properties

Mix Ratio (A:B)	Wt 1:2
	Vol (%) 31:69
Viscosity	A = 13,000 cps
	B = 1,000 cps
	Mixed = 1,500 cps
Density	A = 1.15 kg/l (9.60 lbs/gal)
	B = 1.02 kg/l (8.51 lbs/gal)
Flash Point	A = 205°C (400°F)
	B = 177°C (351°F)
Gel Time	18 min. at 120°C
Curing Guide	75°C (167°F) 15-20 hrs
	95°C (203°F) 6-8 hrs
	120°C (248°F) 2-3 hrs

### Test Methods

<sup>1</sup> 3M Test Method	<sup>5</sup> Fed. Std. No. 406, Method 1031
<sup>2</sup> MIL-I-16923E	<sup>6</sup> Fed. Std. No. 406, Method 4021
<sup>3</sup> Fed. Std. No. 406, Method 1021	<sup>7</sup> Fed. Std. No. 406, Method 4041
<sup>4</sup> Fed. Std. No. 406, Method 1011	

### Typical Data/Physical Properties

Property	Value
Color	Brown
Hardness (Shore D)	55
Specific Gravity (cured)	1.10
Compressive Strength <sup>3</sup>	1300 psi
10% Compression	(91 kg/cm <sup>2</sup> )
Tensile Strength <sup>4</sup>	1300 psi
(1/8" x 1/2" Sample)	(91 kg/cm <sup>2</sup> )
Elongation <sup>4</sup> (% at break)	75
Flexural Strength <sup>5</sup>	3200 psi
(1/2" x 1/2" Sample)	(225 kg/cm <sup>2</sup> )
Thermal Conductivity <sup>2</sup>	4.0x10 <sup>-4</sup>
(Cal/sec/cm <sup>2</sup> /°C/cm)	
Coefficient of Linear Thermal Expansion <sup>2</sup>	
(23°C to 113°C) (length/unit length/°C)	16x10 <sup>-5</sup>
Electric Strength <sup>2</sup>	325 volts/mil
(1/8" [3.175 mm] Sample)	12,800 volts/mm
Thermal Shock <sup>1</sup>	Pass
10 Cycles -55°C to 130°C 1/8" (3.175 mm) Olyphant Insert	
Thermal Shock <sup>2</sup>	Pass
Mechanical Shock Resistance <sup>2</sup>	7.8
(Weight in lbs. of ball causing fracture)	
Moisture Absorption <sup>2</sup>	.92
% weight increase, 240 hrs. @ 96% R.H.	
Water Immersion	
(sample cured 3 hrs. @ 120°C, 1000 hrs. @ 23°C) % weight gain	1.3
Thermal Aging	
(2 1/4" x 2 1/4" x 1/8" sample, 1000 hrs. at 130°C) % weight loss	4.4
Hardness Change (Shore D)	+6
Dielectric Constant <sup>6</sup> (100 cycles @ 23°C)	4.25
Dissipation Factor <sup>6</sup> (100 cycles @ 23°C)	.07
Volume Resistivity <sup>7</sup> (ohm-cm @ 23°C)	2.9 x 10 <sup>14</sup>
Thermal Aging	
(2 1/4" x 2 1/4" x 1/8" sample, 1000 hrs. at 155°C) % weight loss	18.7
Hardness Change (Shore D)	+33
Dielectric Constant <sup>6</sup> (100 cycles @ 23°C)	4.75
Dissipation Factor <sup>6</sup> (100 cycles @ 23°C)	.05
Volume Resistivity <sup>7</sup> (ohm-cm @ 23°C)	3.2 x 10 <sup>14</sup>

**Note:** These are typical values and should not be used for specification purposes.

## Usage Information

### Mixing

Mix the separate parts before removing them from their containers. They may be warmed to 60°C (140°F) to aid mixing. Weigh the correct proportions of the separate parts to within 2% accuracy and combine them. Thoroughly blend the mixture until the color is absolutely uniform or a homogeneous mixture is obtained.

### Deaerating

Entrapped air can be removed by evacuating for 5 to 15 minutes at 5 to 10 mm of mercury (Hg) absolute pressure. Warming the 3M™ Scotchcast™ Electrical Resin to 60°C (140°F) facilitates this process. Container side walls should be four times the height of liquid resin to contain the foaming that takes place under vacuum.

### Casting and Impregnating

Pour the warm resin into the preheated 100°C mold. If no mold is used, dip the preheated part into the resin. Heating the resin and mold aids impregnation. For maximum impregnation, evacuate for 5 to 15 minutes at 5 mm of mercury (Hg) absolute pressure, or pour under vacuum and hold for several minutes before releasing.

### Curing

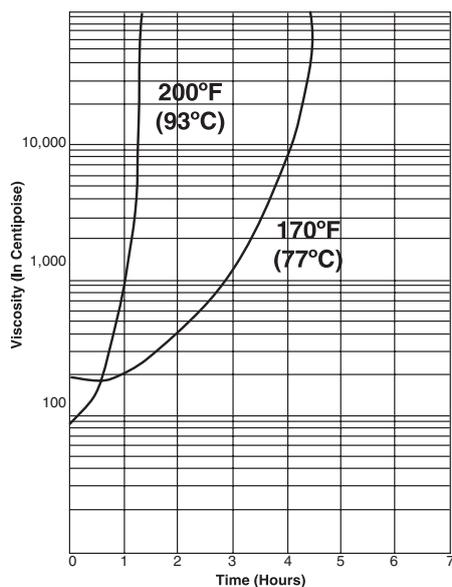
Where minimum stress and maximum thermal shock resistance are required, the lower temperature cure cycle is recommended. (See “Curing Guide” of **Handling Properties** section). Time should be added to the cure cycle to allow the resin to reach the curing temperature.

### Storage

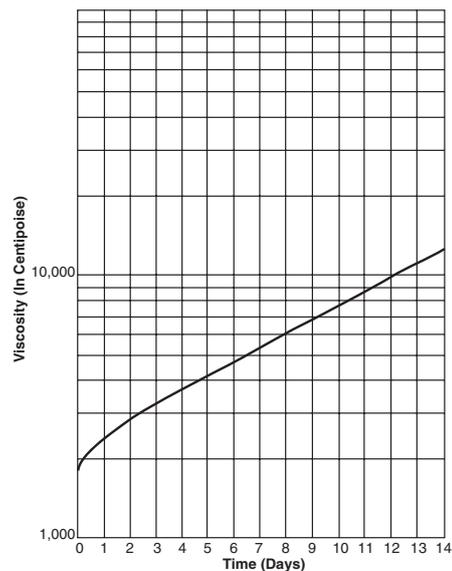
Both parts of this resin system should be stored at temperatures between 20 to 30 degrees Celsius, and 30% to 60% relative humidity. When not in use, containers should be kept tightly closed. Storage at conditions outside those suggested may compromise the performance of the resin.

## Handling and Safety Precautions

Read all Health Hazard, Precautionary and First Aid statements found in the Material Safety Data Sheet (MSDS) and/or product label of chemicals prior to handling or use.



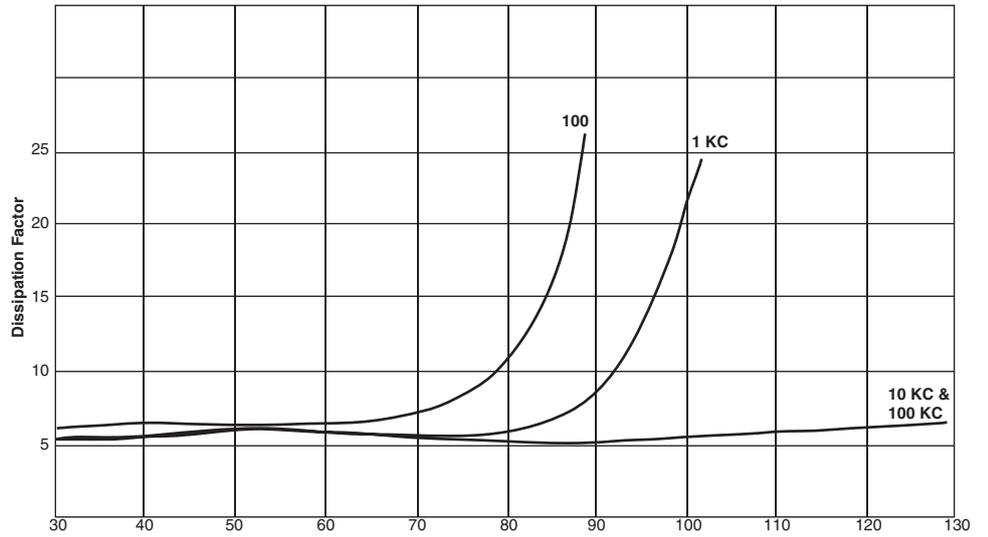
Brookfield Viscosity vs Time @ 170°F (77°C) and 200°F (93°C)



Brookfield Viscosity vs Time @ 73°F (23°C)

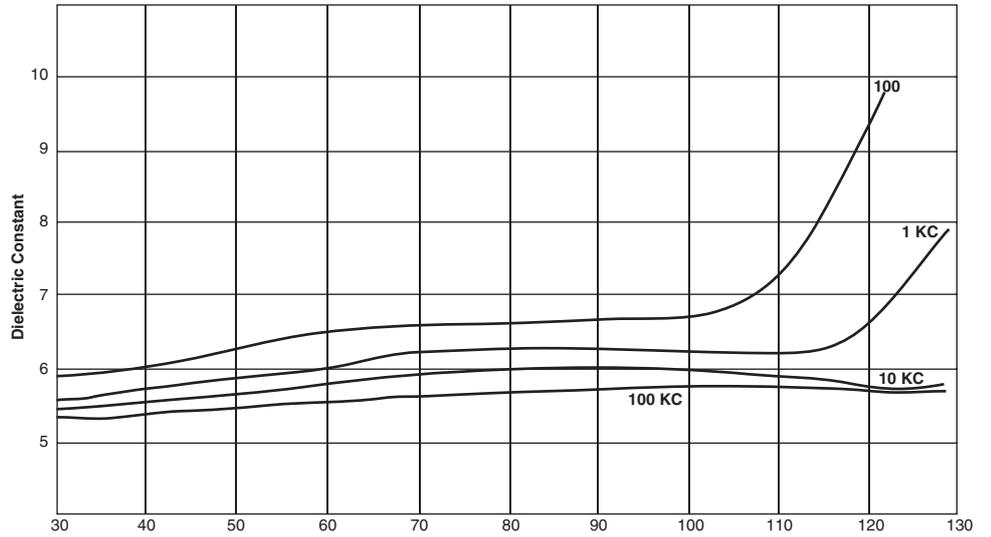
### Dissipation Factor

Fed. Std. No. 406, Method 4021  
(Test Frequencies in Hertz)



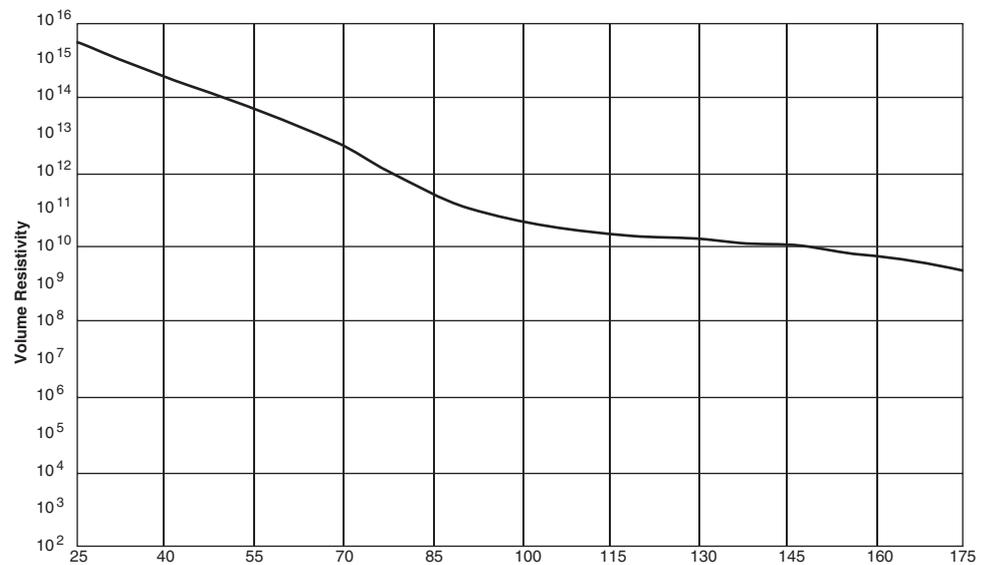
### Dielectric Constant

Fed. Std. No. 406, Method 4021  
(Test Frequencies in Hertz)



### Volume Resistivity (ohm-cm)

Fed. Std. No. 406, Method 4041



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